

47. *On the Occurrence of *Lepidocyclina* (s. s.) in Taiwan (Formosa).*

By Ichirô HAYASAKA and Keinosuke TAN.

Geological Institute of Taihoku Imperial University.

With the Description of Species.

By Shôshirô HANZAWA.

Institute of Geology and Palaeontology, Tohoku Imperial University, Sendai.

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I. As a part of the geological research works on the backbone ridge of Taiwan carried out by the Geological Institute of the Taihoku Imperial University under the financial support of the Japanese Association for the Advancement of Sciences, Hayasaka and Tan traversed in 1937 the ridge by the Kwanzan pass in the southern part of the island: they could collect on the route foraminifera and some other fossils in the rock formations constituting the axial part of Taiwan. The same route was re-examined more closely by Tan in 1939 who obtained additional data of considerable geological and palaeontological importance.¹⁾ Among the foraminifera obtained there are a few orbifold remains which, according to Hanzawa whom the material was entrusted to examine, belong to the genus *Lepidocyclina* (s. s.), which is of extremely rare occurrence in the Pacific region.

II. The Kwanzan pass lies between Kwanzan village, Taitô District on the east and Rokki village, Takao Prefecture on the west, and the road connecting those two villages is one of the main transmontane roads of Taiwan. Along this road a thick series of sedimentary rocks crop out here and there. According to the lithological characters this series is likely to be divided at least into three groups which may be designated temporarily as A, B, and C. Very likely these three subdivisions may approximately be correlated with the respective groups of rock formations devised for the northern part of the island; the following table roughly gives the idea here adopted.

Crystalline Schist Formation	Lower Slate Formation	Upper Slate Formation
Crystalline Schists	Hori Slate Formation	Sansyôkaku Slate Formation
Dainan-ô Series	Suô Series	Urai Series
A Group	B Group	C Group

In distribution the group B occupies the axial part of the backbone ridge, while A and C form its eastern and western slopes respectively. These strata as a whole have a trend of approximately NE-SW, while the general dip is observed to be NW in the east of

1) K. Tan: On the New Localities of Eocene Foraminifera in the Backbone Ridge Region of Taiwan and the Geological Age of the Diabasic Greenstone (in Japanese). The Taiwan Tigaku Kizi, vol. 10, No. 1, 1939.

the pass, a little east of Ritô where the group B is exposed, and is SE in the west of Rito.

The group A consists of chlorite and graphite schists, crystalline limestone, phyllite, schistose sandstone, and the like, while B is predominantly slate with occasional intercalation of sandstone beds; C is mainly shale though at places sandstone and slate take its place. Possibility is that A and B are stratigraphically continuous and that B and C come in contact by dislocation. Though no fossil has up to the present been discovered in the Crystalline Schists, the crystalline limestone and slate from which the occurrence of *Camerina* spp. has been reported¹⁾ may in all probability be considered as to be parts of A. The group B yielded, at several localities in the western slope of the ridge, a faunule consisting of *Camerina* and *Discocyclina*.

The *Lepidocyclina*-rock makes a part of the C group which yields, at several places, *Cyclammia* cf. *formosensis* Yabe and Hanzawa and *Schizaster*-like sea-urchin, beside the species of *Lepidocyclina*. *Cyclammia* and *Schizaster* (or *Paraster*) occur also in the Urai group in the north, so that the geological age of the Urai group may be conjectured from the faunal comparison. The recent discovery of *Assilina* in the neighbourhood of Niitaka-Yama (Mount Morrison)²⁾ may also be referred to as an evidence for that.

III. The mode of occurrence of the *Lepidocyclina*-rock (see Fig. 1). Over a distance of about 1.5 km from the east of the watershed to

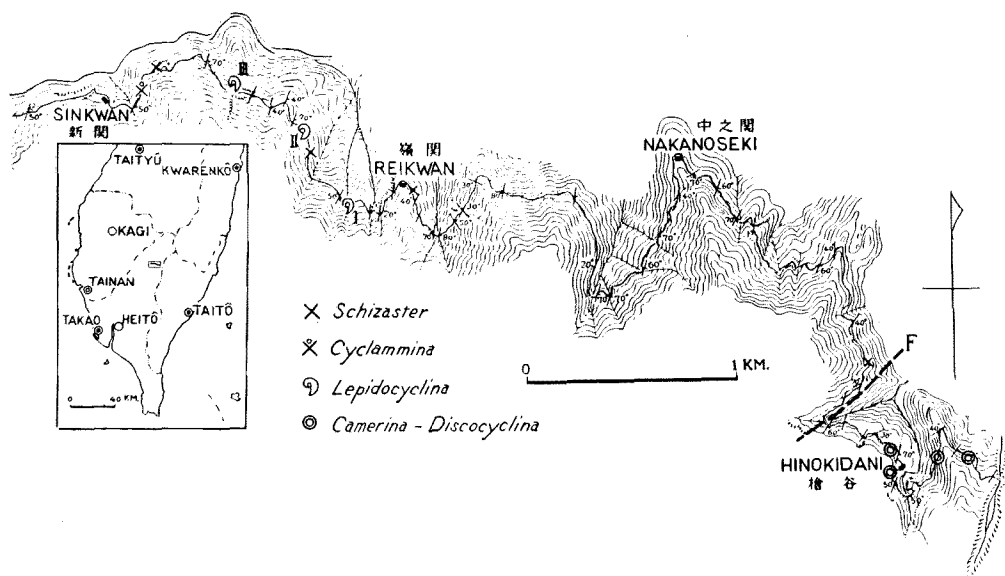


Fig. 1. Map showing the fossil localities.

the west of the police guard-post of Hinokidani, the slate of B is very well developed, and there are several exposures of the foraminiferous

1) K. Tan: On the Occurrence of the Eocene Foraminifera in the Crystalline Schist Formation of Taiwan (Formosa). Proc. **13** (1937), 20.

2) Y. Tomita and K. Tan: On the Discovery of Eocene Foraminifera in the Axial Range along the Mountain Road by Niitaka (in Japanese). The Taiwan Tigaku Kizi, vol. 8, No. 4, 1937.

calcareous sandstone and slate beds containing the *Camerina-Discocyclus* faunule. The strike is NE-SW and the dip SE. Westward, the rock abruptly changes to shales with a local NW dip, suggesting the existence of an overthrust between these two parts. Farther westward the dip turns again to E or SE and intercalation of slate beds and massive sandstone bands in the shale becomes frequent. Following are the localities of the *Lepidocyclus*-containing dark gray calcareous sandstone.

- I. About 1 km west of Reikwan police guard-post (altitude ca. 1824 m).
- II. About 200 m east of the boundary between Reikwan and Sinkwan (ca. 1291 m).
- III. About 800 m farther west.

At the locality I. there are exposed two beds of the *Lepidocyclus*-rock in a distance of about 50 m, with an E or SE dip, the upper bed being about 4 m and the lower, about 6 m in thickness; the lithological characters and fossil contents are the same in both.

At the locality II. were found scattered blocks of variable size of the same *Lepidocyclus*-rock. At the foot of the mountain to the south of it, however, there is an exposure of the same rock, trend and thickness of which were not observed in detail.

At the locality III. the *Lepidocyclus*-rock makes a cliff. The exposure is not good, but it is certain that it is more than 3 m thick. Here the rock has a strike of N 40° E-S 40° E with the SE dip of about 80 degrees. This seems to thrust over a shale formation with a low dip. A little eastward fragmentary fossils of molluscs, besides *Ditrupa* and *Lepidocyclus*, have been discovered in a calcareous sandy shale. In the neighbourhood, sea-urchins and *Cyclammia* have been collected.

IV. Judging from the field observations as well as from the microscopical examination of the rock specimens, it is very likely that one and the same rock bed with the *Lepidocyclus* is exposed repeatedly and the repetition is due to the intense folding and faulting of the rock formation.

In conclusion, we appreciate the financial help given to us by the Japanese Association for the Advancement of Sciences.

Description of Species (by Hanzawa)

Family Orbitoididae Schubert, 1920.

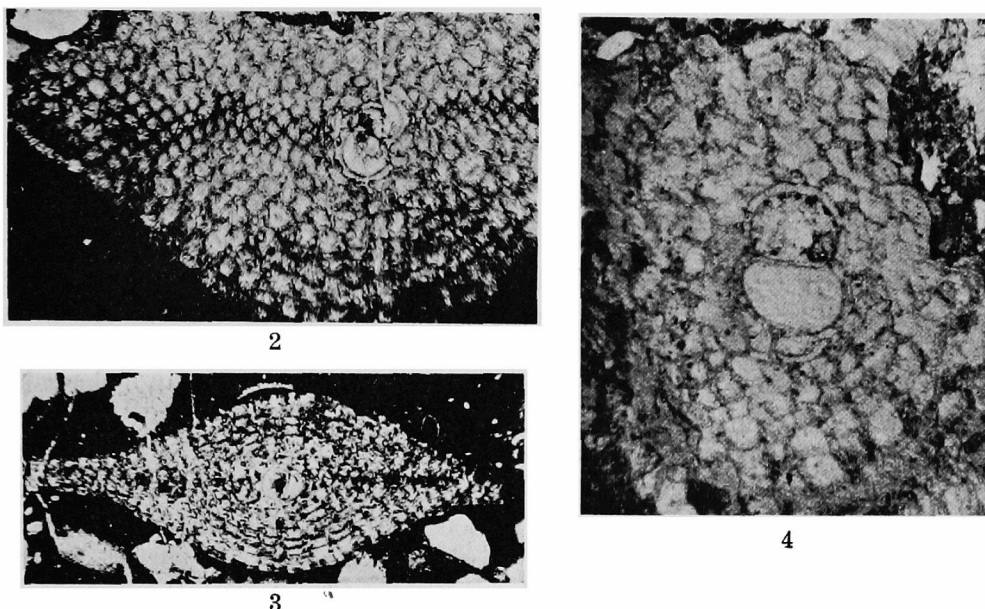
Genus *Lepidocyclus* Gümbel, 1868.

Lepidocyclus (s. s.) *formosensis* Hanzawa, n. sp.

Figs. 2-4.

The specimens of the foraminifera now in question being embedded firmly in a hard calcareous sandstone and inseparable from the matrix, they were examined in slices of the rock under the microscope. The diagnosis is as follows:

Test small, 3 mm in diameter, 1 mm thick, consisting of lenticular umbonal area, 2 mm wide, and thin peripheral flange; nucleoconch ellipsoidal, 250 μ long, 162-188 μ wide, and 162 μ high, constricted at middle; divided by a straight partition, 12 μ thick, into two subequal

Figs. 2-4. *Lepidocyclus* (s. s.) *formosensis* Hanzawa, n. sp.

- Fig. 2. Oblique section through nucleoconch. \times ca. 32
Locality II.
- Fig. 3. Transverse section through nucleoconch. \times ca. 20
Locality II.
- Fig. 4. Equatorial section through nucleoconch. \times 54
Locality III.

hemispherical chambers surrounded by wall 12μ thick; equatorial chambers, concentrically disposed around nucleoconch, lozenge-shaped as usual, but hexagonal near periphery, attaining 62μ in tangential length, 37μ in radial length as well as in height, with roofs and floors 25μ thick; lateral chambers arranged in tier of 9 layers over central part, decreasing in number of layers toward periphery, where equatorial chambers are not covered by lateral chambers; lateral chambers up to 130μ wide and 50μ high over nucleoconch near surface of test, with roofs and floors 12μ thick; pillars traversing lateral layers of chambers, narrow, 37μ in diameter.

The present species stands close to *Lepidocyclus yurnagunensis* Cushman,¹⁾ an Oligocene species of America, but the latter is provided with thicker pillars.

Lepidocyclus boetonensis Van der Vlerk²⁾ described by Van der Vlerk from Boeton, Celebes is distinguished from the present species by its smaller size and equatorial chambers in different form.

The present species is found in association with *Asterocyclus*, another type of orbitoidal foraminifera which is generically indeterminate, *Operculina*, *Heterostegina*, and *Ditrupa*. By this faunal assemblage and also from the stratigraphical position, the foraminiferous rock is regarded safely to be Eocene in age.

1) T. W. Vaughan: Studies of American Species of Foraminifera of the Genus *Lepidocyclus*. Smiths. Misc. Coll. vol. 89, No. 10, 1933, p. 21, pl. 11, Figs. 1-4.

2) Van der Vlerk: The Genus *Lepidocyclus* in the Far East. Ecl. geol. Helv. vol. 21, No. 1, 1928, pp. 187, 191, Table A, Figs. 58 a, b.